In 2/3/987

Preprint from the 1987

BUREAU OF MINES MINERALS YEARBOOK

The Mineral Industry of Indonesia

UNITED STATES DEPARTMENT OF THE INTERIOR

READEX FICHE best copy available

I 28.37/a 2:

UNITED STATES DEPARTMENT OF THE INTERIOR • Manuel J. Lujan, Jr., Secretary

BUREAU OF MINES • T S Ary, Director

This publication is a chapter from the current Bureau of Mines Minerals Yearbook, comprising *Volume I, Metals and Minerals; Volume II, Area Reports: Domestic; Volume III, Area Reports: International.* The separate volumes of the Yearbook are sold by the Superintendent of Documents, Washington, D.C. 20402.

The Mineral Industry of Indonesia

By John C. Wu[1]

Indonesia was the world's largest producer and exporter of liquefied natural gas (LNG), the 3d largest producer of tin, the 4th largest producer of nickel, and the 13th largest producer of crude oil in 1987. Indonesia remained a significant producer of primary aluminum, bauxite, cement, coal, copper concentrate, iodine, and nitrogen fertilizer material in the Far East.

The mineral industry remained a significant sector of the Indonesian economy. The industry continued to contribute about 20% to Indonesia's gross domestic product (GDP) and its exports accounted for 60% of Indonesia's export earnings in 1987. The oil and gas industry, the major player in the mineral industry of Indonesia, recovered slightly from the sharp drop in world oil prices in 1986. The tin industry, the second most important player, also recovered slightly from the drastic decline in tin prices following the October 1985 tin crisis.

The output of crude oil, excluding condensate, was lower than that of 1986 because of the reimposition of production quotas by the Organization of Petroleum Exporting Countries (OPEC) to stabilize world oil prices. But the combined output of crude oil and condensate rose slightly to an average of 1.4 million barrels per day. The output of natural gas broke the previous record high of 1.7 trillion cubic feet owing to increased domestic consumption by LNG plants for new exports to the Republic of Korea.

Coal production also reached a new record high as the output of coal from the Bukit Asam Mine in South Sumatra increased to 1.4 million tons from 1 million tons in 1986. Construction of the Tarahan coal terminal was taken over by a Dutch concern from the British-Canadian consortium and was expected to be completed by 1989. Despite an increase in 1987 coal production, Indonesia continued to import 400,000 tons of coal from Australia to meet requirements for the Suralaya thermal powerplant in West Java.

Oil and gas exploration slowed substantially because of uncertainty in the world oil market and continued weakness in world demand for oil. The number of exploratory wells dropped sharply to 82 from 156 in 1986 and 254 in 1985. However, seven oil and gas exploration and development contracts were signed with major foreign oil companies from Canada, the Netherlands, the United Kingdom, and the United States. Exploration of coal in Kalimantan and Sumatra continued. Two major foreign contractors, having a production-sharing contract with the state coal mining company, planned to start production in 1988 or 1989.

The output of most minerals and metals, except bauxite, increased in 1987 because of higher prices in the world market. Copper production at the Ertsberg Mine in Irian Jaya by Freeport Indonesia Inc. (FI) of the United States, under a first generation contract of work, broke a previous record high. As a result of extensive drilling in the Ertsberg mining area, FI increased its estimated proven and probable ore reserves of copper to 99.6 million tons averaging 1.7% copper from 62.8 million tons averaging 2.3% copper.

The combined gold production from the Ertsberg Mine, P.T. Aneka Tambang's (P.T. Antam) Cikoto Mine in South Banten, and two foreign contractors' mines in Bengkulu, South Sumatra, and Cempaka Buang Kasongan, Central Kalimantan, also broke a previous record high. Because of increased gold prices during the past 2 years, unprecedented growth in gold mining by so-called

people's miners and small-scale illegal miners, mostly operating in Kalimantan and Sumatra, was reported. The Government planned to stop all illegal gold mining in 1988. In 1987, the Government of Indonesia awarded 60 more Contracts of Work to foreign companies bringing the total to 103 for gold exploration and development in Indonesia. The promotion of increased gold production and exports was part of the Government's strategy to improve export earnings of nonoil commodities.

Combined nickel production by P.T. Antam in the Pomalaa area and on Gebe Island, and P.T. International Nickel Indonesia (P.T. Inco) in the Soroako area reached a new record high. Because of higher nickel prices and an effective cost-reduction program. P.T. Inco, for the first time since it began commercial operations in 1979, reported a net income in 1987. The tin industry continued to implement the Government policy to reduce costs by increasing mine output. As a result, tin production increased 2,100 tons over that of 1986. The higher production was mostly by P.T. Tambang Timah (P.T. Timah), the state-owned tin mining company, from its onshore and offshore operations of Bangka Island. The company reported that its production cost was reduced to $2.59[3] per pound from $2.72 per pound in 1986.

The expansion in cement capacity has been postponed until 1990 because of excess capacity and weak demand in the Far East. The industry continued to implement its coal conversion program to save oil and gas for export. However, the nitrogen fertilizer industry continued its expansion program. Construction of the third urea plant by P.T. Pupuk Kalimantan Timur in Bongtang, East Kalimantan, was on schedule for completion in July 1988. By 1989, the annual urea capacity should be raised to 5.0 million tons from 4.5 million tons.

In the metallic mineral processing sector, production of primary aluminum by P.T. Indonesia Asahan Aluminum (IN-ALUM) in North Sumatra decreased slightly due to power shortages caused by lower water levels for the smelter's hydroelectric powerplant at Lake Toba. Production of nickel sulfate matte by P.T. Inco at Soroako, South Sulawesi, was below the 1987 target resulting from the temporary closure of a smelter for modernization. Production of steel by P.T. Krakatau Steel in Cilegon, Java, increased slightly owing to stronger domestic and overseas demand for its products. The company planned a $400 million modernization and expansion program during the next 5 years. Production of refined tin by P.T. Timah at Mentok, Bangka Island, increased only slightly because of a tin-export quota of 24,516 tons for Indonesia imposed in March by the Association of Tin Producing Countries.

Contracts for two liquefied petroleum gas (LPG) plants were awarded to two Japanese companies in February. A 1.6-million-ton-per-year LPG plant will be built at Arun in North Sumatra and a 350,000-ton-per-year LPG plant will be built in Bontang, East Kalimantan, at a cost of $879 million. Both plants were scheduled to come on-stream in 1988. A contract for a 1.5-million-ton-per-year LNG plant at Badak near Bontang, East Kalimantan, was expected to be awarded by the Government in early 1988.

The Indonesian economy, as measured by the real GDP, grew 3.5% compared with 3.2% (revised) in 1986.[3] The growth was attributed to higher export prices for oil and gas. However, impressive gains in export earnings of nonoil commodities also contributed to the growth in the Indonesian economy. Indonesia's GDP in 1983 constant dollars was estimated at $52,050 million in 1987 compared with $50,290 million in 1986. The inflation rate, as measured by the Consumer Price Index, was down slightly to 8.0% from 9.2% in 1986.[4]

Because of increased export earnings from oil and gas as well as other commodities, Indonesia's merchandise trade balance improved considerably. In 1987, export earnings of oil and gas in the form of LNG were $8.7 billion, while export earnings of nonfuel minerals and metals were estimated at $980 million.

PRODUCTION

Because of the improved world market, most minerals and metals production in Indonesia increased in 1987. The mineral fuels sector continued to dominate Indonesia's mineral industry. Production of crude oil, excluding condensate, was down slightly because of reduced quotas imposed by OPEC. Production of natural gas reached another record-high level resulting from increased consumption by the LNG plants

Table 1.—Indonesia: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1983	1984	1985	1986	1987[p]
METALS					
Aluminum:					
Bauxite, gross weight thousand tons	778	1,003	830	650	635
Metal, primary	114,766	198,960	216,820	218,772	201,402
Copper, mine output, Cu content	[r]78,589	[r]82,503	[r]88,742	95,781	102,058
Gold, mine output, Au content[2] troy ounces	76,888	78,677	[r]84,208	106,226	114,746
Iron and steel:					
Iron sand, dry basis	132,887	82,997	130,930	153,271	193,986
Metal:					
Ferroalloys, ferronickel	20,708	22,774	23,789	22,554	15,175
Steel, crude	800,000	1,000,000	1,200,000	1,500,000	1,453,000
Manganese ore	8,318	12,267	33,295	1,424	1,196
Nickel:					
Mine output, Ni content[3]	49,378	47,604	40,236	52,679	57,788
Metallurgical products:					
Matte: Ni content	18,288	22,815	24,946	27,975	26,582
Ferronickel: Ni content	4,855	4,826	4,802	4,548	3,060
Silver, mine output, Ag content thousand troy ounces	1,135	1,121	[r]1,228	1,498	1,530
Tin:					
Mine output, Sn content	26,554	23,223	21,759	24,049	26,183
Metal	28,390	22,467	20,909	22,080	24,200
INDUSTRIAL MINERALS					
Asbestos[e]	25,000	25,000	25,000	25,000	25,000
Cement, hydraulic thousand tons	8,187	8,907	10,081	10,941	11,837
Clays:					
Bentonite	10,006	12,505	6,659	[e]10,000	7,762
Kaolin powder	59,628	83,414	106,869	124,937	113,536
Diamond:[e]					
Industrial stones thousand carats	22	22	22	22	22
Gem do.	5	5	5	6	7
Total do.	27	27	27	28	29
Iodine kilograms	25,297	24,970	13,416	5,750	8,227
Nitrogen: N content of ammonia	1,150,400	1,658,200	[r]2,057,300	2,298,500	2,363,900
Phosphate rock	5,573	1,917	525	601	2,592
Salt, all types thousand tons	618	370	[e]600	[e]600	[e]600
Stone:					
Granite do.	2,405	1,583	1,421	1,240	1,181
Limestone[4] do.	12,073	11,314	11,770	12,784	15,571
Marble square meters	24,374	16,108	9,699	3,530	8,184
Quartz	372,216	541,827	682,125	[e]650,000	[e]670,000
Sulfur, elemental[5]	2,769	4,999	4,023	[e]4,000	[e]5,000
MINERAL FUELS AND RELATED MATERIALS					
Asphalt rock, natural	533,188	471,239	450,633	242,055	84,889
Coal thousand tons	648	1,468	1,942	2,601	2,834
Gas, natural:					
Gross million cubic feet	1,186,362	1,521,450	1,580,012	1,628,920	1,732,052
Marketed do.	1,032,321	1,386,051	1,148,628	1,113,286	1,188,358
Petroleum:					
Crude including field condensate thousand 42-gallon barrels	490,483	516,990	483,768	507,241	509,029
Refinery products:					
Gasoline do.	12,980	21,879	23,619	28,119	[e]29,000
Jet fuel do.	2,760	4,923	3,845	1,631	[e]3,000
Kerosene do.	31,660	39,141	38,383	43,043	[e]45,000
Distillate fuel oil do.	37,522	43,935	50,060	73,490	[e]74,000
Residual fuel oil do.	66,596	67,160	19,006	30,221	[e]30,000
Lubricants do.	487	93	1,263	1,574	[e]1,600
Liquefied petroleum gas do.	471	674	2,101	2,787	[e]3,000
Paraffin wax do.	76	82	79	116	[e]100
Naphtha do.	19,074	14,736	17,148	17,306	[e]17,200
Unfinished oils requiring further processing do.	2,405	1,032	25,710	22,621	[e]23,000
Unspecified do.	5,657	3,678	24,150	2,533	[e]3,000
Refinery fuel and losses do.	5,169	2,251	8,527	10,004	[e]11,000
Total do.	184,866	199,534	213,891	233,445	[e]239,900

[e]Estimated. [p]Preliminary. [r]Revised.

[1]Table includes data available through Aug. 2, 1988.

[2]Includes Au content of copper ore and output by Government-controlled foreign contractors' operations. Gold output by operators of so-called people's mines and illegal small-scale mines is not available but may be as much as 15 tons per year.

[3]Includes a small amount of cobalt that is not recovered separately.

[4]Data represent limestone used for cement production. Excludes considerable amounts of limestone produced by enterprises under local jurisdictions for building materials, for crushed rock to be used as aggregate, and to burn for lime.

[5]Sulfur produced by other than the Frasch process.

for new exports to the Republic of Korea. Production of coal also reached record-high level owing to increased output from the Bukit Asam Mine and other smaller coal mines operating in South Sumatra and East Kalimantan, despite a considerable decline in coal production from the Ombilin Mine.

In the metallic minerals sector, production of bauxite decreased slightly owing to reduced overseas demand, especially from Japan. Production of copper, gold, nickel, and silver all broke previous record highs in 1987. Copper, gold, and silver produced by FI continued the 1986 upward trend resulting from improved market conditions and the company's successful cost-containment program. Unrecorded gold production by the people's mines and other small-scale illegal miners operating in Kalimantan and Sumatra was estimated to be as large as 15 tons for each of the past 2 years. Production of nickel ore by P.T. Antam rose substantially resulting from a stronger demand from Japan. Production of tin also increased considerably because of the Government's policy to reduce production costs by increased output from higher ore-grade tin mines.

In the industrial minerals sector, production of limestone moved higher because of increased domestic consumption by the cement industry. Production of kaolin was also at a higher level than that of 1986 due to increased domestic demand by the ceramic, paper, and cosmetic industries and more exports to Japan. Exploration for diamonds by a foreign contractor in southeastern Kalimantan indicated the possibility of dredging diamond-bearing gravel within 2 years.

In the mineral processing sector, production of LNG and urea both broke previous highs in 1987, resulting from expanded capacities and increased exports. Production of cement also reached a record-high level because of stronger demand by the construction sector. Production of primary aluminum by IN-ALUM in North Sumatra was down because of an electrical power shortage in the fall. Production of ferronickel by P.T. Antam and nickel matte by P.T. Inco was at a lower level than that of 1986 because of equipment failure and a temporary plant shutdown for modernization.

TRADE

The merchandise trade balance improved substantially resulting from a considerable increase in export earnings from crude oil and nonfuel commodities and a slight increase in imports. Export earnings from crude oil and refined petroleum products rose to $6.1 billion from $5.4 billion in 1986, reflecting increased world oil prices. Export earnings from LNG declined to $2.6 billion from $2.8 billion in 1986, owing to rebates to Japanese importers for overcharges in 1986. Export earnings from nonfuel commodities reached a record-high level reflecting continued strong support by the government to promote exports of so-called nonoil commodities.

Export earnings of nonoil commodities exceeded those of oil and gas beginning in August, as they averaged more than $800 million per month compared with $728 million per month for oil and gas. The substantial gain in earnings from exports of nonoil commodities was due to increased world market prices for commodities such as coffee, copper, gold, nickel, palm oil, plywood, rubber, timber, and tin. The estimated value of major mineral exports in 1987 were copper concentrate, $190 million; primary aluminum, $180 million; gold, $176 million; refined tin, $144 million; steel products, $130 million; nickel matte, $120 million; ferronickel, $15 million; and bauxite, $8 million.

Imports of merchandise rose slightly to $11.2 billion because of more imports of chemicals, machinery, and electrical equipment. However, imports of transport equipment, consumer durables, and paper products were lower than in 1986. Imports of crude petroleum for domestic refineries and other mineral fuels increased slightly to $2.3 billion from $2.2 billion in 1986 resulting from higher prices of crude oil and coal.

Based on the value of two-way trade, Japan, the United States, Singapore, and the European Economic Community (EEC) countries remained the major trading partners of Indonesia. In mineral trade, based on value, crude oil went mainly to Japan, the United States, and the Republic of Korea; LNG to Japan and the Republic of Korea; aluminum, bauxite, copper, gold, and nickel mainly to Japan; tin to Japan, the United States, and many EEC countries; cement to Bangladesh; and coal to Japan and many Asian countries. The EEC countries, Japan, and the United States remained the principal suppliers of Indonesia's capital goods, chemicals, machinery, and electrical equipment in 1987.

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—Bauxite production by P.T. Antam from Bintan Island and three nearby small islands decreased slightly from that of 1986 despite a new sales contract signed in late 1986 for exports to the Republic of Korea. Exports of bauxite to Japan dropped to 531,000 tons from 597,000 tons in 1986 and from 992,000 tons in 1984. As a result of reduced demand by Japan, P.T. Antam reportedly planned to export an additional 200,000 tons to Middle East countries, 100,000 tons to the United States, and 50,000 tons to the Republic of Korea in 1988.

To revive the plan to construct a 600,000-ton-per-year alumina plant on Bintan Island, the Government of Indonesia formed a team through the Technology Research and Application Board to restudy the project and was seeking $500 million of capital funding from foreign investors as partners in the project. The bauxite reserves on Bintan Island for the alumina plant were estimated at 75 million tons averaging 49.4% Al_2O_3 and 8.2% SiO_2.

Production of primary aluminum by INALUM at Kuala Tanjung in North Sumatra was about 8% lower than that of 1986. The production cutback during the third quarter resulted from a low level of water at Lake Toba where the smelter's hydroelectric powerplant is based. The smelter reportedly resumed near-capacity production by yearend. Exports of primary aluminum, mostly to Japan, reportedly dropped to 146,000 tons from 180,000 tons in 1986.

In June, an agreement was finally reached between the Governments of Indonesia and Japan to rescue IN-ALUM from financial difficulties. The problems were caused by increased payments of interest and principal resulting from the appreciation of the Japanese yen and decreased revenues resulting from low U.S. dollar-based world market prices of aluminum. Under the agreement, the Japanese partners were to invest an additional $172 million and the Government of Indonesia was to invest $58 million. The new capital reportedly would be used for debt service. To reduce the heavy debt burden of INALUM, the Government of Indonesia also agreed to convert its $231 million loan to IN-ALUM into equity capital while the Export-Import Bank of Japan, the major creditor, was expected to cut its interest rates on loans to IN-ALUM from 7% to 8% to 5%.[3]

Copper.—Production of copper in concentrate by FI at the Ertsberg (Gunung Bijih) Mine in Irian Jaya reached 102,000 tons in 1987, a record-high level since the mine started commercial operation in 1972. According to the company's 1987 annual report, production costs were reduced further (including depreciation and gold and silver credits) to $0.48 per pound of copper. Because of record production and its cost-containment program, FI ranked among the lowest cost copper producers in the world. Ore processing averaged 16,371 tons per day compared with 15,124 tons per day in 1986. The amount of copper, gold, and silver contained in 259,000 tons of concentrate produced in 1987 was 102,058 tons, 92,000 troy ounces, and 1,344,000 troy ounces, respectively. Despite a slight decrease in exports, revenues rose to $190 million compared with $151 million in 1986 owing to increased market prices for copper, gold, and silver.

According to the company's 1987 annual report, the average market price of copper, gold, and silver was $0.85 per pound, $441.73 per troy ounce, and $6.74 per troy ounce, respectively, compared with $0.62 per pound, $359.00 per troy ounce, and $5.42 per troy ounce, respectively, in 1986. Owing to a 26% increase in revenues and a further reduction in production cost, FI's net income rose sharply to $50.8 million from $19.5 million in 1986.

As a result of extensive definition drilling of two new ore bodies by FI in its mining contract area, a significant quantity of ore reserves was ascertained and added to FI's reserve base in 1987. The estimated proven and probable ore reserves in the Ertsberg mining area at yearend 1987, including the Ertsberg and Ertsberg East ore bodies plus the new ones (the Deep Ore Zone under Ertsberg East and the DOM ore body, 800 meters to the south of Ertsberg East) were 99.6 million tons containing 1.7% copper.[4]

Gold.—After the Government lifted the gold export ban in the fall of 1986 and because of the high world market price of gold, Indonesia experienced a gold mining miniboom in 1987. More than 115,000 troy ounces of gold was produced in 1987, breaking the record-high level of 1986. Addi-

tionally, according to estimates by some observers in Indonesia, unrecorded gold production from traditional people's and illegal mining operations in Sumatra and Kalimantan was between 10 and 13 tons per year during the past several years.

Of the official gold total, 92,000 troy ounces was produced by FI at the Ertsberg copper mine, 18,000 troy ounces by P.T. Lusang Mining from the Lebong Tandai gold-silver mine in Bengkulu, South Sumatra, and 5,000 troy ounces by P.T. Antam from the Cikotok gold-silver mine in South Banten, West Java. However, according to an estimate by the Department of Mines and Energy, 100,000 miners were illegally searching for and mining gold in Bali, Java, Kalimantan, and Sumatra. Gold production by these miners, mostly panned gold from rivers and streams, has never been recorded. From October 1986 to September 1987, official exports of gold totaled 9.1 tons valued at $121.5 million.

The illegal miners occasionally caused problems for foreign contractors and traditional people's miners by overrunning their sites when word of a gold strike was heard. To protect the traditional miners and foreign contractors, the Department of Mines and Energy planned to issue instructions to the provincial Governors and local military officials to eliminate illegal gold mining activities in 1988.

During 1987, two contractors started gold operations in Kalimantan. P.T. Ampalit Mas Perdana, a joint venture of Pelsart Resources N.L. (42.5%) and Jason Mining Ltd. (42.5%) of Australia, and P.T. Yanawati Perdana (15%) of Indonesia, started mine development at Cempaka Buang Kasongan in Central Kalimantan. Two bucketwheel suction dredges ordered from Neumann Equipment Pty. Ltd. of Australia were scheduled to arrive at the mine by November for stripping overburden and delivering the ore to the spiral floating treatment plant. Gold production was scheduled to begin in 1988 at an initial rate of 16,000 troy ounces per year. P.T. Monterado Mas Mining, a joint venture of BP Minerals International Ltd. of the United Kingdom (65%), the International Finance Corp. (20%), and P.T. Prima Searco (15%) of Indonesia, also started mine construction at Monterado in the Sambas region of West Kalimantan. P.T. Monterado Mas reportedly also ordered two Neumann bucketwheel dredges for stripping and mining, and awarded Mineral Deposits Ltd. of Australia a contract to build two alluvial gold plants and a concentrate upgrading plant for the Monterado Mine. Commercial gold production was scheduled to begin in late 1988 at an initial rate of 16,000 troy ounces per year.

In line with the Government policy to increase nonoil commodity exports, Indonesia continued to promote gold exploration in 1987. In addition to 9 Contracts of Work (COW) awarded in 1985 and 34 in 1986, 60 were awarded in 1987 bringing the total to 103 concessions covering more than 35.5 million hectares. Most contract areas, however, were concentrated in the following Provinces: East, Central, West, and South Kalimantan, North Sulawesi, and Jambi and Bengkulu in Sumatra. There were 51 prime foreign contractors for the COW, of which 33 were from Australia, 6 from Hong Kong, 5 from Singapore, 3 from the United Kingdom, 3 from the United States, and 1 from Malaysia. The three U.S. companies were Newmont Mining Corp. with three contracts and Pennzoil Co. (through Duval Corp. of Indonesia) and Battle Mountain Gold Co. with two contracts each.[7]

During 1986-87, a significant number of substantial gold anomalies in West Kalimantan were identified by Dominion Gold Mines Ltd. (DGM) of Hong Kong, a subsidiary of Dominion Mining Ltd. of Australia. In October, DGM, under a joint-venture agreement with P.T. Antam (17.5%) was awarded three contracts by the Government of Indonesia covering 7,437 square kilometers in West Kalimantan. P.T. Antamdomin Bengkayang was established for one of the contract areas to undertake followup work on anomalies in the Bengkayang area of West Kalimantan.

In anticipation of an increase in gold production, P.T. Antam was expanding the capacity of its Logam Mulia precious metals refinery in Pulo Gadung from 13 to 24 tons per year, which was expected to be completed in the spring of 1988. The precious metals produced at the refinery included gold, platinum, and silver.

Iron and Steel.—Iron sands produced by P.T. Antam from the southern coastal area of Central Java rose substantially because of increased domestic demand and exports. Production of sponge iron and steel by Krakatau Steel from its integrated complex at Cilegon, 120 kilometers west of Jakarta, also increased considerably owing to strong overseas demand for its products. Because of a substantial increase in exports, mostly to Japan and the United States, Krakatau

Steel's export earnings rose to $130 million from $56 million in 1986.

To increase production and improve quality and efficiency, Krakatau Steel planned to launch a 5-year $400 million modernization and expansion program in 1988. The 5-year program included upgrading the company's direct-reduction plant by converting the existing HYL I fixed-bed process to an HYL III continuous process; doubling the plant's capacity to 4 million tons per year; expanding the capacity of billet and slab production from 1.5 to 2.5 million tons per year; and increasing the capacity of the hot-strip and wire-rod mills from 1.1 million to 1.8 million tons per year and from 200,000 to 250,000 tons per year, respectively.[8]

Nickel.—Because of a significant improvement in the world nickel market in the last half of 1987, production of nickel ore rose sharply. Production by P.T. Antam from the Pomalaa area in southeastern Sulawesi and on Gebe Island in the North Moluccas reached 1.9 million tons of which 76% was produced from Gebe Island. Exports of nickel ore to Japan declined slightly to 1.3 million tons from 1.4 million tons in 1986.

Ferronickel produced by P.T. Antam from its 4,800-ton-per-year smelter at Pomalaa decreased to 3,060 tons of contained nickel resulting from a temporary shutdown because of heavy damage to an old furnace. The plant was overhauled with imported equipment to increase productivity and efficiency. Exports of ferronickel, mostly to Japan and India, remained at 4,100 tons of contained nickel in 1987.

P.T. Inco, an integrated nickel operator in the Soroako area of South Sulawesi, produced 26,532 tons of nickel in nickel-sulfate matte compared with 27,975 tons (revised) in 1986. A higher production target of 29,500 tons was planned for 1988 because of expected strong demand from Japan and the anticipated tightening of the world nickel supply in 1988. Exports of nickel-sulfate matte to Japan rose to 29,603 tons from 28,656 tons in 1986.

As a result of a successful cost-reduction program, the higher market price of nickel, and increased sales to Japan, the company reported operating earnings of $15 million and a net income of $500,000 in 1987 for the first time since it started commercial operation in 1979.

According to P.T. Inco's annual report, the cost of its nickel production was reduced by 50% between 1982 and 1987. Of this reduction, 20 percentage points were achieved in 1987 through technological improvements, energy cost and employment reductions, and a steady increase in production. At yearend, proven and probable nickel ore reserves in the Soroako contract area were 76.2 million tons containing 1.5 million tons of nickel.

Tin.—Despite only a moderate improvement in the world tin market, Indonesia's tin production continued upward. However, the 1987 output was 1,000 tons less than the Government-targeted production of 27,216 tons. Cost reduction through increased production continued to be the Government policy for the tin mining industry in 1987. Under an agreement reached by the seven-member Association of Tin Producing Countries (including Indonesia) in early 1987, Indonesia's tin exports were limited to 24,516 tons in 1987.

P.T. Timah, the state-owned company, continued to dominate the tin mining industry producing 21,636 tons of tin in concentrate, which accounted for 83% of the total production. P.T. Koba Tin, a joint-venture company of P.T. Timah (25%) and C.S.R. Ltd. (36.5%) and Boral Ltd. (36.5%) of Australia, produced 4,042 tons and accounted for 15% of total production. P.T. Preussage Kelapa Kampit, which took over underground tin mining operations on Belitung Island from P.T. Broken Hill Pty. in 1985, produced 519 tons and accounted for 2% of total production.

During the past, the dredging sector played a significant role in helping the tin mining industry reduce tin production costs by increasing productivity in Indonesia. In 1987, 28 of 33 dredges, including three large offshore dredges—Belitung I, Bangka II, and Singkep I—reportedly were operating onshore and offshore around the islands of Bangka, Belitung, Singkep, Kundur, and Karium off the southeastern coast of Sumatra. According to P.T. Timah, its production by dredging rose to 58% in 1987 from 47% in 1980. Of the company's 12,550 tons of tin produced by dredges, 81% was offshore and 19% onshore.

Production of refined tin by P.T. Timah's smelter, Peleburan Timah (Peltim), at Mentok on Bangka Island increased to 23,800 tons from 22,080 tons in 1986. Peltim produced two brands of tin metal (Mentok and Bangka) in 35-kilogram ingots, 17.5-kilogram ingots, tin anode, and tin shot for domestic and export markets. Mentok tin,

with a minimum of 99.85% tin, was produced for domestic and overseas markets. Bangka tin with a minimum of 99.935% tin and a maximum of 0.014% arsenic, 0.014% lead, and 0.001% bismuth, was marketed directly to domestic and overseas consumers and could not be resold or reexported. According to the Department of Mines and Energy, exports of refined tin declined to 22,195 tons from 23,300 tons in 1986, but export earnings of tin rose slightly to $144 million from $140 million (revised) in 1986 owing to a slight increase in price. However, because of a weak domestic market, domestic consumption of tin dropped sharply to 880 tons from 1,166 tons in 1986. As a result of increased export earnings and a further reduction in production cost to $2.59 per pound from $2.72 in 1986, P.T Timah reportedly made a net profit of $ 3 million in 1987.[9]

P.T. Koba reportedly acquired a used dredge from Selangor Dredging Bhd. of Kuala Langat, Malaysia, and awarded a $12 million contract to Osborne Chappel Payne Ltd. of the United Kingdom in November to provide design engineering and project management services for transferring the dredge from Kuala Langat to its contract area in Southeast Bangka Island. The dredge, with 139 buckets and capable of digging to a maximum depth of 40 meters, has a 5.4-million-cubic-meter capacity. P.T. Koba planned to deploy the dredge in late 1988.

According to the Department of Mines and Energy, Indonesia has proven and probable tin ore reserves of 1.64 million tons of which 740,000 tons were proven. About 1.28 million tons of these reserves were on Bangka Island and 705,000 tons of these reserves were offshore.

INDUSTRIAL MINERALS

Cement.—Cement production continued to increase as domestic sales and exports rose moderately to 10 million tons and 2 million tons, respectively, in 1987. According to the Indonesia Cement Association, annual capacity would remain at 17.4 million tons until 1990 because of excess capacity and keen competition in the Far East and Southeast Asia markets. In 1987, about 1 million tons of cement was exported to Bangladesh, while about 276,000 tons of cement clinker was exported to Singapore.

The cement industry continued its coal conversion program. In 1987, P.T. Semen Andalas Indonesia reportedly completed conversion of its oil-fired grinding plant at Lhok'nga, 16 kilometers south of Banda Aceh in North Sumatra, to pulverized coal.[10] Coal consumed by the plant was supplied from the Ombilin Mine in West Sumatra.

Diamond.—Acorn Diamond Indonesia Pty. Ltd. (ADI), a subsidiary of Australia's Acorn Securities Ltd., upgraded the reserves of its Danau Seran alluvial diamond property in southeastern Kalimantan to 29 million to 34 million cubic meters of diamondiferous gravel and has proven 2 million cubic meters by detailed dredge path design drilling. According to ADI, a bulk sample of 5,085 cubic meters yields an average grade of 0.2 carat per cubic meter.

ADI reportedly was investigating the use of idle tin dredges in Malaysia for mining the diamond bearing gravels. According to preliminary estimates, at a cost of $15 million for reconditioning a dredge and production of 203,000 carats at a stripping ratio of 4.3 to 1 for 1 million cubic meters of gravel, the production cost would be $45 per carat or $9 per cubic meter. The diamond-bearing gravel in the Danau Seran area reportedly also contains gold and platinum having an estimated value of $35.50 per cubic meter.[11]

Fertilizer Materials.—Indonesia's fertilizer industry continued to expand with Government support under the fourth 5-year development plan (1985-89). In the nitrogen sector, the annual urea capacity of five producers was expanded from 3.3 million tons in 1984 to 4.5 million tons in 1985. The capacities of the five operating urea producers in 1987 were P.T. Pupuk Sriwijaya, 1,620,000 tons with four plants in Palembang, South Sumatra; P.T. Pupuk Kalimantan Timur (Kaltim), 1,140,000 tons with two plants in Bontang, East Kalimantan; P.T. Asean-Aceh Fertilizer, 570,000 tons, and P.T. Pupuk Iskandar Muda, 570,000 tons, both plants at Lhokseumawe in Aceh, northeastern Sumatra; and P.T. Pupuk Kujan, 570,000 tons in Tjikampek, West Java. In 1987, most urea producers were operating near capacity. Construction of Kaltim's third 570,000-ton-per-year plant in Bontang, East Kalimantan, reportedly was on schedule for completion in mid-1988 and commercial production in early 1989.

In the compound fertilizer sector, P.T. Petrokimia Gresik, which underwent several phases of expansion, operated a large compound fertilizer complex in Gresik, East Java. The company has an annual capacity

of 1 million tons of triple superphosphate and 650,000 tons of ammonium sulfate fertilizer. It produced 1.5 million tons of compound fertilizer in 1987.

MINERAL FUELS

Coal.—Coal production continued its upward trend and reached another record-high level in 1987. Increased output from the Bukit Asam Mine in South Sumatra and several private coal companies in East Kalimantan and in the Bengkulu area of South Sumatra contributed most to the increase.

Coal produced by state-owned Perusahaan Umum Tambang Batubara (P.N. Batubara) at the Ombilin Mine in West Sumatra declined from 710,000 tons in 1986 to 506,000 tons because of equipment failures and other problems caused by prolonged heavy rain. Coal produced by state-owned P.T. Tambang Batubara Bukit Asam at the Bukit Asam Mine in South Sumatra rose from 1.0 million tons in 1986 to 1.4 million tons, of which 78% came from the Muara Tiga deposit and the remainder from the Air Laya deposit where mining was started in April. Construction of the Tarahan coal terminal at the southern tip of Sumatra, part of the Bukit Asam expansion, was taken over by Balast Nedam BV of the Netherlands from a British-Canadian consortium and was expected to be completed by 1989.

Coal production by six private coal companies including C.V. Fadjar Bumi, C.V. Baiduri Enterprise, P.T. Kitadin Coop., P.T. Tanito Harum in East Kalimantan, and P.T. Bukit Sunur and P.T. Danau Mas Hitam in Bengkulu Province was estimated to be 978,000 tons in 1987. Coal produced by these companies mostly was either exported or consumed by domestic cement plants in South Sumatra.

P.T. Allied Indo Coal, a foreign coal contractor, reportedly completed a road for hauling coal from its Parambahan Mine to the nearby Ombilin Mine in October. It started coal production at an initial rate of 300,000 tons per year in November. Some of the Parambahan coal was exported to Malaysia in 1987.

P.T. Kideco Jaya Aguny (KJA), another foreign contractor, was developing a new coal mine at Samarangau in East Kalimantan and planned to begin production at 300,000 tons per year in 1988. KJA, which discovered coal reserves of 683 million tons in the Pasir deposit in October 1983, was a consortium of four companies from the Republic of Korea led by Samchuk Consolidated Coal Mining Co. Most of the coal produced by KJA initially would be delivered to the Suralaya powerplant in West Java. However, some coal will be exported when the output reaches 2 million tons per year in 1992.

After 5 years of exploration, P.T. Kaltim Prima Coal (KPC), also a foreign contractor, discovered a large, high-volatile bituminous coal reserve with a low ash, low sulfur, and high calorific value. The reserves are in the Pinang Coalfield, 20 kilometers from a deepwater port site on the east coast, north of Samarinda, East Kalimantan. According to KPC, coal reserves of six major coal seams and numerous minor seams were estimated at 150 million tons and were amenable to open pit mining. KPC, a joint venture of Conzinc Rio Tinto Ltd. of Australia and British Petroleum Ltd. of the United Kingdom, reportedly was conducting a market study for exporting most of the coal to Asian countries. KPC planned to start production in 1988.

Petroleum and Natural Gas.—Because of the OPEC quota, Indonesian crude oil production decreased slightly from that of 1986 but exceeded the OPEC quota of 1.133 million barrels per day. The output of crude oil, excluding condensate, averaged 1.24 million barrels per day compared with 1.26 million barrels per day in 1986. However, the output of condensate rose to an average of 153,000 barrels per day from 133,000 barrels per day in 1986.

In 1987, Indonesia exported 57% of its crude oil output, including condensate, principally to Japan, the United States, and the Republic of Korea, in order of value. Exports of crude oil and condensate in 1987 totaled 292 million barrels compared with 327 million barrels in 1986. Despite a decline in the volume of exports, export earnings for crude oil and condensate rose to $6.1 million from $5.4 million in 1986 because of higher prices. According to an industry source, the decline in exports was caused by OPEC restraints, low overseas demand, and increased crude oil consumption by domestic refineries. The export prices of Indonesian heavy crude oils were adjusted upward in August 1987 from $14.88 to $15.62 per barrel for Bima crude, from $15.60 to $16.10 for Duri crude, and from $17.10 to $17.20 for Cinta crude. The export price of Minas light crude remained at $17.56 per barrel in 1987.[13]

Asamera Oil Indonesia Ltd. reportedly

proved 15.4 million barrels of oil and 201 billion cubic feet of gas reserves at the Corridor block in South Sumatra after discovery in 1985. Asamera Oil and Bow Valley Industries of Canada, which signed a production-sharing contract with PERTAMINA, the state-owned oil and gas company, for joint exploration and development of oil and gas in 1983, began a 15-well development project. Commercial production was scheduled to start at 8,000 barrels per day in 1988. The joint venture was owned by Asamera Oil, 54%; Bow Valley, 36%; and PERTAMINA, 10%.

Oil and gas exploration continued its downward trend despite an improvement in the world oil market. The number of exploratory wells drilled dropped sharply to 82 from 156 in 1986, while seismic profiling declined to 27,730 kilometers from 28,734 kilometers in 1986. However, drilling of development wells reportedly increased substantially in 1987.

Encouraged by recovery of world oil prices, PERTAMINA signed seven new production-sharing contracts with foreign companies compared with three in 1986. The seven companies and their contract areas were Continental Oil Co. (Conoco) of the United States in the 43,944-square-kilometer Warim block onshore and offshore in western Irian Jaya; Britoil PLC of the United Kingdom in the 24,986-square-kilometer Sula block offshore central Sulawesi; Occidental Oil Co. of the United States in the 22,650-square-kilometer Bureau block off the west coast of Irian Jaya; Conoco and Shell in the 18,903-square-kilometer area onshore and offshore Buton Island in southeast Sulawesi; Shell BV of the Netherlands in the 12,630-square-kilometer Asem-Asem block offshore South Kalimantan; a joint venture of Chevron Corp. and Texaco Inc. of the United States in the 12,000-square-kilometer Manui block offshore southeast Sulawesi; and Enim Oil Corp., a subsidiary of Southern Cross Ltd. of the United States, in the 1,137-square-kilometer Lomatang block onshore in South Sumatra.

Natural gas production increased to a record-high level in 1987 owing to more output by Mobil Oil Indonesia (Mobil) from its Arun Gasfields in Aceh, North Sumatra. Mobil produced 759 billion cubic feet of natural gas accounting for 46% of the output. Mobil was followed by Roy M. Huffington Co., accounting for 22% and producing 379 billion cubic feet of natural gas from its Badak Gasfields in East Kalimantan. Of the gas produced, 53% was used for LNG; 23% for producer consumption; 9% flared; 8% for manufacturing nitrogen fertilizer materials; and 7% for use by cement, steel, and LPG plants, oil refineries, and the city gas and utility industries. Sales of natural gas totaled 1.2 trillion cubic feet in 1987.[13]

Indonesia remained the world's largest producer and exporter of LNG in 1987. Production and exports of LNG rose 10% to 866 trillion British thermal units or the equivalent of 407,000 barrels per day of crude oil because of new exports to the Republic of Korea. However, export earnings from LNG dropped 10% to $2.6 billion resulting from rebates to Japanese customers for overcharges in 1986 and lower price in 1987.

Indonesia made further progress in production and exports of LNG in 1987. Following the signing of a 20-year sales contract with the Republic of Korea in October 1986, Indonesia made its first shipment of LNG to that country in late 1986 at the rate of 2 million tons per year. Additionally, it has exported more than 15 million tons of LNG per year to Japan since 1985. In March, another 20-year sales contract was signed with Taiwan for PERTAMINA to supply 1.5 million tons per year of LNG to the Chinese Petroleum Co. beginning in 1990. The LNG pricing formula for Taiwan reportedly was identical to that of Japan. In August, PERTAMINA also signed a sales contract with Chubu Electric Power Co. of Japan to supply LNG to the company over a 3-year period at an annual rate of 700,000 tons beginning in October 1987.

To increase production capacity for increased exports of LPG to Japan, PERTAMINA awarded two construction contracts to two Japanese companies in February. A $700 million contract for a 1.6-million-ton-per-year plant at Arun in Aceh, North Sumatra, reportedly was awarded to a consortium led by JGC Corp. The other contract was awarded to Chiyoda Chemical Engineering & Construction Co. for a $179 million, 350,000-ton-per-year plant in Bontang, East Kalimantan. Both plants were scheduled for completion in 1988. Under a contract signed in July 1986 with seven Japanese importers, Indonesia was expected to supply 1.95 million tons of LPG over a 10-year period beginning in 1988 or 1989.[14] A $400 million contract to build a 1.5-million-ton-per-year LNG train at the Badak LNG plant in East Kalimantan was expected to be awarded in early 1988.

[1]Economist, Division of International Minerals.
[2]Where necessary, values have been converted from Indonesian rupiah (Rp) to U.S. dollars at the rate of Rp1,644 = US$1.00.
[3]Far Eastern Economic Review (Hong Kong). V. 139, No. 7, Feb. 18, 1988, p. 75.
[4]U.S. Embassy, Jakarta, Indonesia. State Dep. Airgram A-022, Dec. 23, 1987, p. 1.
[5]Mining Journal (London). V. 308, No. 7919, May 29, 1987, p. 412.
[6]Freeport-McMoRan Inc. 1987 Annual Report. Pp. 15, 42, 47, 68, and 69.
[7]U.S. Embassy, Jakarta, Indonesia. State Dep. Telegram 19527, Dec. 16, 1987, pp. 1-6; and State Dep. Airgram A-006, Feb. 4, 1988, pp. 25-26.
[8]Metal Bulletin (London). No. 7241, Dec. 3, 1987, p. 27; No. 7256, Feb. 1, 1988, p. 23.
[9]U.S. Embassy, Jakarta, Indonesia. State Telegram 03532, Mar. 8, 1988, p. 1.
[10]Rock Products. V. 91, No. 4, Apr. 1988, p. 85.
[11]International Mining (London). V. 4, No. 9, Sept. 1987, p. 57.
[12]U.S. Embassy, Jakarta, Indonesia. State Dep. Telegram 02635, Feb. 23, 1988, p. 1.
[13]———. State Dep. Telegram 04915, Mar. 31, 1988, p. 1.
[14]———. State Dep. Telegram 02917, Feb. 29, 1987, p. 1.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1989— 242-377/82042